AMENDMENTS TO THE CLAIMS

In accordance with the PTO's amendment format, a detailed listing of all claims has been provided. A status identifier is provided for each claim in parentheses following each claim number. Changes to the claims are shown by strikethrough or double bracketing (for deleted text) or underlining (for added text).

In the Claims:

Claims 1-34 were previously pending.

Please amend claims 2, 6, 9, 12, 19, 21, 22, and 25-30 as shown below.

Claims 1, 5, 20, 23-24, and 31-34 are canceled.

No new claims are added.

Claims 2-4, 6-19, 21-22, and 25-30 are pending.

Claims

1. (Canceled)

2. (Currently amended) A method, comprising: ~~as recited in claim 1~~

determining onsets from a music clip;

estimating tempo from an onset curve of the music clip;

determining beat candidates from the onsets;

determining from beat candidates, segments of beat sequences that are synced to an actual beat phase;

rectifying segments of beat sequences that are out-of-sync with the actual beat phase; and

wherein the rectifying segments ~~comprises:~~ includes

building a phase tree from each segment;

searching the phase trees to determine a largest sequence of segments that share a same beat phase;

assuming that the largest sequence of segments are synced segments that follow the actual beat phase;

assuming that all segments that are not in the largest sequence of segments are out-of-sync segments; and

rectifying the out-of-sync segments.

3. (Original) A method as recited in claim 2, wherein the building comprises determining if a subsequent segment shares the same beat phase as a current segment;

if the subsequent segment shares the same beat phase as the current segment, inserting the subsequent segment into the phase tree as a child segment of the current segment; and

iterating the previous 2 steps until all segments are processed.

4. (Original) A method as recited in claim 2, wherein the rectifying the out-of-sync segments comprises following the actual beat phase for the out-of-sync segments.

5. (Canceled)

6. (Currently amended) A method, ~~as recited in claim 1,~~ comprising:

determining onsets from a music clip;

estimating tempo from an onset curve of the music clip;

determining beat candidates from the onsets;

determining from beat candidates, segments of beat sequences that are synced to an actual beat phase; and

rectifying segments of beat sequences that are out-of-sync with the actual beat phase, wherein the determining beat candidates ~~comprises~~ includes

calculating a beat confidence for each onset; and

detecting beat candidates from the onsets based on the beat confidence of each onset.

7. (Original) A method as recited in claim 6, wherein the calculating comprises:

representing a rhythm pattern of the music clip with a beat pattern template; and

matching the beat pattern template along the onset curve of the music clip.

8. (Original) A method as recited in claim 6, wherein the detecting beat candidates comprises:

adaptively setting a threshold; and

comparing the beat confidence for each onset to the threshold.

9. (Currently amended) A method, ~~as recited in claim 1,~~ comprising:

determining onsets from a music clip;

estimating tempo from an onset curve of the music clip;

determining beat candidates from the onsets;

determining from beat candidates, segments of beat sequences that are synced to an actual beat phase; and

rectifying segments of beat sequences that are out-of-sync with the actual beat phase,

wherein the estimating tempo from an onset curve of the music clip ~~comprises:~~ includes

summing onset curves of a lowest sub-band and a highest sub-band to determine the onset curve of the music clip;

generating an auto-correlation curve from the onset curve of the music clip; and

calculating a maximum common divisor of prominent local peaks of the auto-correlation curve.

10. (Original) A method as recited in claim 9, further comprising estimating a length of a bar of the music clip.

11. (Original) A method as recited in claim 10, wherein the estimating a length comprises:

calculating the length as a maximum common divisor of three peaks in the auto-correlation curve if the three peaks are evenly spaced within the tempo of the music clip; and

if the three peaks are not evenly spaced within the tempo of the music clip, selecting the position of the maximum peak within the tempo as the length.

12. (Currently amended) A method ~~as recited in claim 1~~, comprising:

determining onsets from a music clip;

estimating tempo from an onset curve of the music clip;

determining beat candidates from the onsets;

determining from beat candidates, segments of beat sequences that are synced to an actual beat phase; and

rectifying segments of beat sequences that are out-of-sync with the actual beat phase;

wherein the determining onsets from [[a]] the music clip ~~comprises:~~ includes

down-sampling the music clip into a uniform format;

dividing the music clip into a plurality of non-overlapping temporal frames;

calculating the frequency spectrum of each frame;

dividing each frame into a plurality of octave-based sub-bands;

calculating an amplitude envelope of a lowest sub-band and a highest sub-band;

detecting an onset curve from the amplitude envelope; and

determining the onsets as local maximum variances in the amplitude envelope.

13. (Original) A method as recited in claim 12, wherein the down-sampling the music clip into a uniform format comprises down-sampling the music clip to a 16 kilohertz, 16 bit, mono-channel sample.

14. (Original) A method as recited in claim 12, wherein the dividing the music clip comprises dividing the music clip into a plurality of 16 microsecond-long frames.

15. (Original) A method as recited in claim 12, wherein the calculating the frequency spectrum of each frame comprises calculating a fast Fourier transform of each frame.

16. (Original) A method as recited in claim 12, wherein the dividing each frame into a plurality of octave-based sub-bands comprises dividing each frame into 6 octave-based sub-bands.

17. (Original) A method as recited in claim 12, wherein the calculating an amplitude envelope comprises convolving the lowest sub-band and a highest sub-band with a half raise cosine Hanning window.

18. (Original) A method as recited in claim 12, wherein the detecting an onset curve from the amplitude envelope comprises calculating the variance of the amplitude envelope of each of the lowest sub-band and a highest sub-band.

19. (Currently amended) A ~~processor-readable medium~~ method comprising: ~~processor-executable instructions configured for:~~

determining beat candidates from onsets of a music clip;

estimating a tempo of the music clip;

determining from beat candidates, beat segments having sequential beats with intervals of one or more tempos;

locating synced segments that are synced to an actual beat phase;

locating out-of-sync segments that are out-of-sync with an actual beat phase; and

rectifying the out-of-sync segments, wherein the rectifying comprises tracking the out-of-sync segments with the actual beat phase.

20. (Canceled)

21. (Currently amended) A ~~processor-readable medium~~ method as recited in claim 19, wherein the locating synced segments further comprises:

building a phase tree from each segment having sequential beat candidates;

locating segment sequences whose beat candidates share the same phase and whose combined beat candidates outnumber the combined beat candidates in other segment sequences; and

designating the located segments as synced segments.

22. (Currently amended) A ~~processor-readable medium~~ method as recited in claim 19, wherein the locating out-of-sync segments comprises:

finding segments that are not in a largest sequence of segments which share a same phase.

23-24. (Canceled)

25. (Currently amended) A ~~processor-readable medium~~ method as recited in claim ~~24~~ 19, further comprising ~~wherein~~ ~~the~~ detecting the onsets, including ~~comprises~~:

down-sampling the music clip to a uniform format;

dividing the music clip into temporal frames;

calculating the spectrum of each frame;

dividing each frame into six octave-based sub-bands;

calculating an amplitude envelope from a lowest sub-band and a highest sub-band;

calculating variance of the amplitude envelope to determine an onset curve; and

extracting the onsets as local maximum variances.

26. (Currently amended) A ~~processor-readable medium~~ method as recited in claim 19, wherein the determining beat candidates from onsets of a music clip comprises:

calculating a confidence level for each onset; and

comparing the confidence level for each onset to a threshold.

27. (Currently amended) A ~~processor-readable medium~~ method as recited in claim 26, wherein the calculating comprises:

representing a rhythm pattern of the music clip with a beat pattern template; and

matching the beat pattern template along the onset curve.

28. (Currently amended) A ~~processor readable medium~~ method as recited in claim 19, wherein the estimating a tempo comprises:

determining an onset curve of the music clip;

generating an auto-correlation curve from the onset curve; and

calculating a maximum common divisor of prominent local peaks of the auto-correlation curve.

29. (Currently amended) A ~~processor readable medium~~ method as recited in claim 28, further comprising ~~processor executable instructions configured for~~ estimating a length of a bar of the music clip.

30. (Currently amended) A ~~processor readable medium~~ method as recited in claim 29, wherein the estimating a length comprises:

calculating the length as a maximum common divisor of three peaks in the auto-correlation curve if the three peaks are evenly spaced within the tempo of the music clip; and

if the three peaks are not evenly spaced within the tempo of the music clip, selecting the position of the maximum peak within the tempo as the length.

31-34. (Canceled)